LibertyBLUE

Microwave Peptide Synthesizer

Peptide synthesis made fast and efficient

CEM

We are peptide synthesis

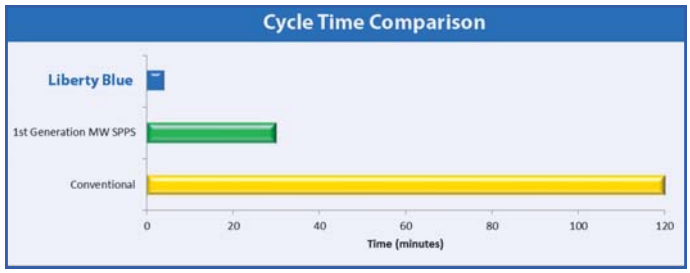
LibertyBLUE

Automated Microwave Peptide Synthesizer

CEM is transforming the way chemists perform peptide synthesis once again with the introduction of the Liberty Blue™ Microwave Peptide Synthesizer. More than just a face-lift, the Liberty Blue System has been designed for maximized speed and efficiency. With a 4-minute cycle time and a 90% reduction in solvent consumption, no other peptide synthesizer on the market can even come close to the performance of the Liberty Blue. Unparalleled peptide quality, greater flexibility, and improved reliability make Liberty Blue the system of choice for all your peptide synthesis needs.

Remarkably fast

- Rapid reagent addition
- Optimized synthesis methods
- >80% time reduction compared to 1st generation microwave synthesizers
- Difficult peptides such as A-beta in hours rather than days



The 4-minute cycle time of the Liberty Blue System is not limited to easily synthesized peptides. These methods can be used to routinely synthesize a wide range of peptides. Using the standard Liberty Blue methods, A-beta 1-42 was prepared in less than **4 hours** in 68% crude purity.

- 4-minute cycle time
- 90% solvent reduction

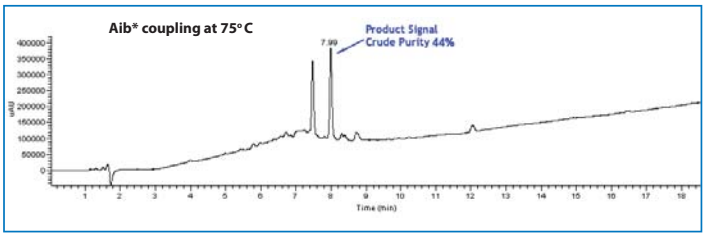
Maximum efficiency

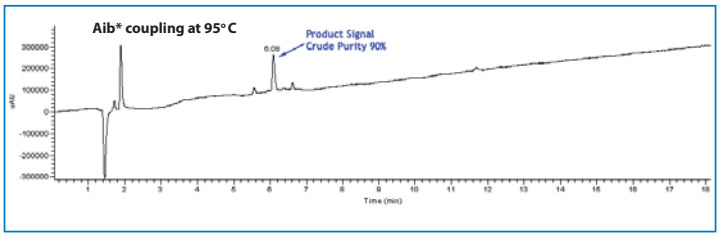
- Up to 90% solvent reduction
- Less reagent usage
- No priming required
- Judicious use of solvent for washing
- Accurate and precise reagent addition

Benefits of microwave control

Liberty Blue offers several advantages over alternative heating methods. The microwave energy can be controlled for each step, and the reaction temperature can be carefully selected depending on the specific peptide and/or reagents used. CEM is the only microwave provider than can apply the microwave energy to the entire process. Microwave irradiation heats the reaction from the inside rather than the outside making it possible to rapidly change the temperature from one stage to the next. This can be especially important when synthesizing peptides containing temperature-sensitive amino acids, such as phosphopeptides, or peptides containing difficult to couple residues such as Aib. The synthesis of the double Aib containing peptide below was performed with the coupling of the second Aib residue at both 75 °C and at 95 °C with all of the rest of the conditions the same. The coupling at 75 °C resulted in only 44% crude purity with a significant Aib deletion while the 95 °C gave 90% crude purity.

Peptide Sequence: GEQKLGAib*AibASEEDLG-NH$_2$





Flexibility

- Flex-Add™ technology eliminates need for sample loops and allows infinite volume delivery options
- Synthesis conditions (temperature, power, and time) can be controlled for each step of every amino acid cycle
- 27 AA positions provide ample capacity for unusual amino acids or reagents
- Unlimited number of couplings with amino acid stock solutions
- 3 reaction vessel sizes (10-, 30-, and 125-mL) to cover the full synthesis scale range
- Scale range from 0.025 to 5 mmol
- Resin loading option allows high-throughput peptide synthesis
- Optional cleavage accessory for rapid peptide cleavage and deprotection
- UV monitor available to track the synthesis progress and provide improved synthesis results

Amino Acid Bottles

- 20 natural amino acids
- 7 additional positions for unusual amino acids or reagents
- Up to 120-mL bottles

Reaction Vessels

10-, 30-, and 125-mL vessels standard

Fiber Optic

Accurate internal temperature measurement

Microwave

- Fastest and most controlled technology for peptide synthesis at elevated temperature
- Patented technology for applying microwave energy to both the coupling and deprotection

Solvent Resistant Composite Covers

Waste Level Detection

Compact Footprint

20"W x 18"D x 30"H [with all bottles]
(51cm x 46cm x 76cm)

LED Lights

- Visual indicators of the current system status and operation
- Assist with set up of the instrument

Flex-Add™ Technology

Liberty Blue's patent-pending Flex-Add Technology is a new approach to reagent addition that utilizes pressure to measure reagent volume. This technology does not rely on optical sensors to control the amount of reagent added, and therefore, eliminates fixed sample loops on the system. Without sample loops, the system now has the flexibility to add exactly the volume desired and provides virtually infinite volume accessibility. The Flex-Add Technology is both accurate and precise over a large volume range, allowing for both small and large scale syntheses to be performed on the system seamlessly.

Volume Requested	Volume Delivered	Average Delivered	Standard Deviation
2	2.02	2.03	0.02
2	2.05		
2	2.03		
1	1.05	1.05	0.01
1	1.06		
1	1.05		
0.5	0.55	0.53	0.02
0.5	0.53		
0.5	0.51		

Simplicity

Liberty Blue is the easiest peptide synthesizer on the market to operate. The liquid handling module features 50% fewer processing valves than its Liberty1 predecessor. The software is easy to use with built-in default methods, as well as the flexibility to create customized methods. The software also features a reagent calculator to aid in the setup of the system. The Liberty Blue is also the fastest system to setup. With a maximum of 31 total reagent bottles to put on the system, setup can be completed in just a matter of minutes.

Reliability

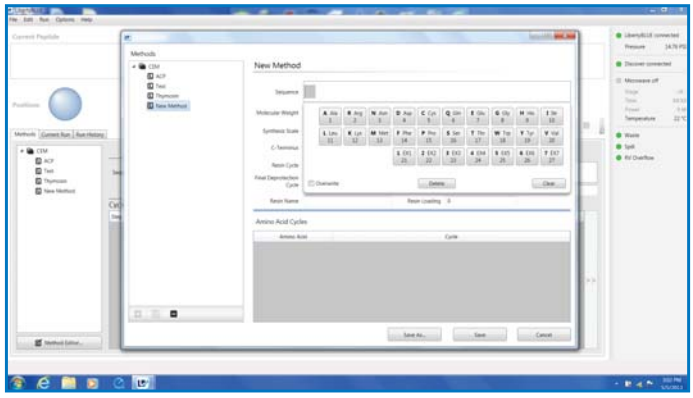
- All valves are backpurged immediately after use eliminating the need for extra washing and preventing clogging issues
- Reduced routine maintenance with fewer valves and the elimination of optical sensors for reagent addition
- Flex-Add technology is not susceptible to bubble formation, unlike optical sensors
- Uninterrupted pathway allows fast & efficient purging
- Pressure detection for all chemical transfers
- Detailed run history and error reporting
- Waste level detection
- Best-in-class service and support

Liberty Blue Software

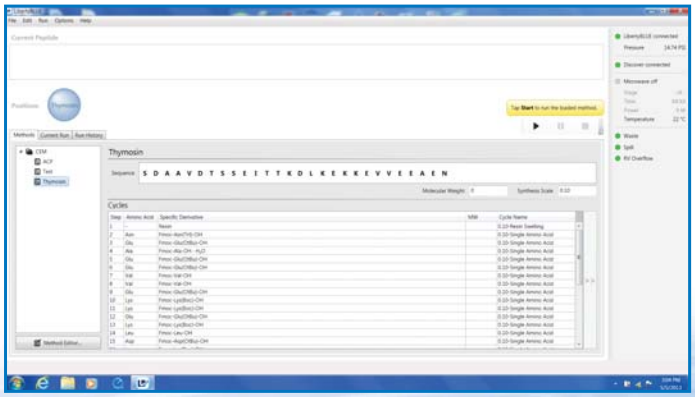
The control software makes programing and running the Liberty Blue System fast and easy.

- Preprogrammed default methods for the full synthesis scale range
- Easy-to-use "Change Bottle" feature for rapid system set up
- Usage and reagent calculators make reagent preparation simple
- Fully customizable methods and cycles
- Self-diagnostics and automated cleaning routines

Create sequence specific method



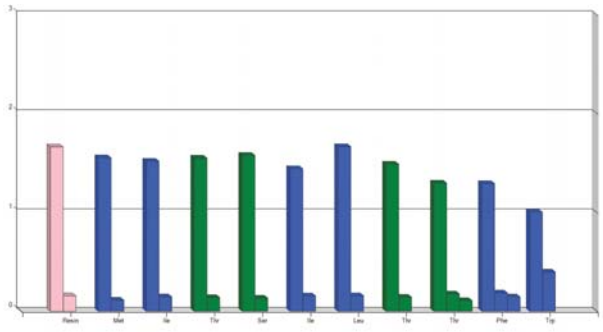
Load method and press play



OPTIONS FOR THE LIBERTY BLUE SYSTEM

UV Monitoring

Liberty Blue can be upgraded with the optional Fmoc UV monitoring feature. This system monitors the waste stream from the deprotection reactions and automatically modifies the synthesis conditions in difficult regions of the peptide. The software features a user-defined feedback loop that will allow for double coupling, extended coupling times, and capping to be used in any combination during the coupling of difficult amino acids in the peptide. The UV monitoring feature provides many benefits including information about coupling efficiency that can be used in subsequent syntheses, structural information about the peptide sequence, more efficient use of synthesis reagents, and improved peptide product. The UV monitor is incorporated directly into the unit and requires no additional bench space.



Resin Loader

A modular high-throughput option is available that will allow up to 24 peptides to be synthesized sequentially, significantly increasing throughput. The resin loader comes in a 12-position module which can be coupled with an additional 12-position module. With the rapid 4-minute cycle time and the potential to synthesize 24 peptides unattended overnight, Liberty Blue provides throughput comparable to conventional high-throughput systems, but with considerably better purity.

Parallel Peptide Synthesis Faster Than Ever Before

- Synthesize 24 x 20-mer peptides in less time than a conventional parallel synthesizer
- Complete control of synthesis conditions for every peptide

	Liberty Blue HT	Synthesizer
Cycle Time	4 minutes	120 minutes
Transfer Time	5 minutes	-
Synthesis Time (24 x 20-mer)	32 hours	40 hours

Cleavage option

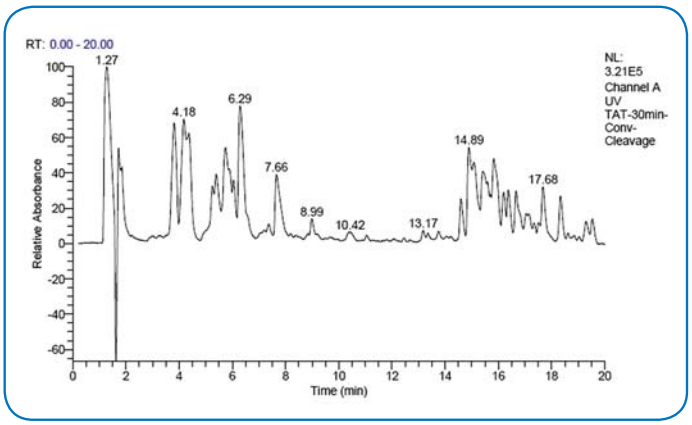
The cleavage option is an isolated liquid handling module designed for performing the peptide cleavage step. The isolated module protects the Liberty Blue System from the harsh reagents required for the cleavage, while allowing the use of microwave irradiation to provide high-quality peptides in excellent yields in a fraction of the time.

Increased Purity of Difficult Sequences

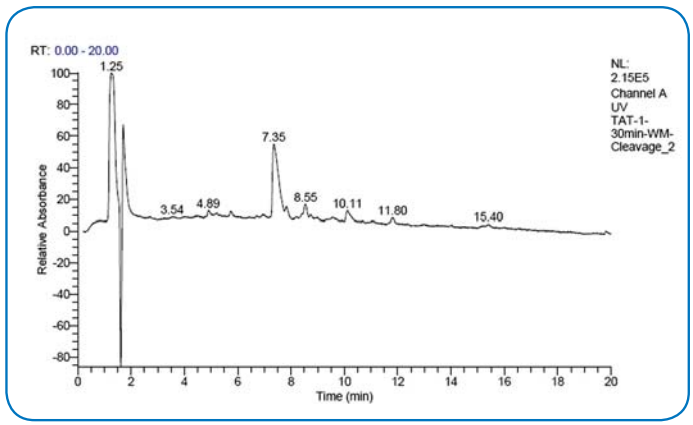
Peptide: Fmoc-YGRKKRRQRRR

Conditions: TFA/TIS/H_2O/DODT (92.5/2.5/2.5/2.5)

Conventional: 30 min , room temperature Crude Purity: ~7%



Microwave: 30 min, 38 °C Crude Purity: ~79%



The Microwave Advantage

Utilizing microwave energy to drive peptide reactions is one of the major breakthroughs in peptide synthesis since Bruce Merrifield invented solid phase peptide synthesis in the 1960s. Though it is a well-known fact that heating chemical reactions makes them proceed faster, microwave energy brings more to peptide synthesis than a rapid change in temperature. Microwave energy directly couples at the molecular level with polar and ionic species. The movement of the molecules trying to align themselves with the electric field of the microwave causes motion, and thus, produces heat. However, it is this transfer of kinetic energy that makes all of the difference in microwave peptide synthesis. The constant realignment of the peptide chain in the microwave field accelerates the reaction and helps to keep it from aggregating, significantly improving results of the synthesis.

- License included with each system allowing the use of microwave energy for both the coupling and deprotection steps
- Fastest cycle times available
- Unparalleled peptide purity and yield compared to conventional synthesis
- Significantly reduces purification time and waste
- Access to peptides impossible to synthesize under conventional conditions

US7393920; US7582728; US8058393; EP1491552; JP4773695

Additional worldwide patents pending

SYSTEM SPECIFICATIONS

Synthesis Scale	0.025 – 5 mmol
Reaction Vessel Sizes	10-, 30- and 125-mL standard
Chemistry	Fmoc only
Activation Method	In situ, standard activators
Amino Acid Reagents	20, plus 7 additional positions
External Bottle Positions	2, plus 7 additional positions
Temperature Measurement	In situ fiber-optic
Fluid Measurement	Flex-Add – amino acids, activator, activator base Timed delivery – Main wash, Deprotection
Agitation	Programmable inert gas bubbling
Waste Container	1 L reservoir with overflow detection
Controller	Laptop with wireless option standard
Optional Features	UV monitor Resin Loader for high throughput Cleavage module
Reports	Printable .pdf file for each method created. Log created during each run of every step performed
Power	120V/60Hz or 240V/50Hz
Dimensions	20"W x 18"D x 30"H (51 cm x 46 cm x 76 cm)
License	The purchase of this instrument includes a grant of a limited, non-transferrable license to utilize this instrument for microwave peptide synthesis using microwave energy for both the coupling and deprotection steps.
Patents	US7393920; US7582728; US8058393; EP1491552; JP4773695, with additional worldwide patents pending

Who is CEM?

Since 1978, CEM has been the world's leading provider of microwave laboratory systems with a complete portfolio of award-winning instruments and industry-leading, CAD-designed technology for the analytical laboratory, synthetic chemistry, bioscience, and process control markets. In 2003, CEM introduced the world's first microwave peptide synthesizer, an automated system that produced peptides in greater purities and higher yields than any process previously available. Since then, we have continued to design and develop new technologies and methods to improve the peptide synthesis process. CEM systems can be found in Fortune 500 companies, leading universities, and research facilities around the world. Our commitment to you doesn't end when your unit is shipped, it begins.

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